## REMARKS

Reconsideration of the above-identified patent application, as amended, is respectfully requested. The present amendment is responsive to the Office Action mailed June 10, 2002. A petition for an extension of time in which to respond to the Office Action accompanies this amendment.

Claims 1-5, 7-9 and 16-27 are pending in the application. Applicants acknowledge that claims 16-22 of the Preliminary Amendment filed April 11, 2001 have been correctly number as claims 21-27.

**§112, ¶2**

Claims 7-9, 16-20 and 23-27 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The Office Action objected to the term "U-O method" in claim 7 at lines 11-12.

In response to this rejection, claim 7 has been amended by the present amendment in accordance with the suggestion of the Office Action.

In view of the present amendment, it is respectfully requested that the rejection under 35 U.S.C. §112, second paragraph, be withdrawn.

**§103**

Claims 1, 7-9 and 20-25 have been rejected under 35 U.S.C. §103(a) being unpatentable over the European Patent Application No. 0 466 606.

Claim 2-5 and 16-19 were rejected under 35 U.S.C. §103(a) as being unpatentable over the European Patent Application No. 0 466 606 in view of U.S. Patent No. 4,859,415 to Shida et al. or U.S. Patent No. 5,226,981 to Meredith et al.

These rejections are respectfully traversed.

**Patentability**

**EP 0466606 A1 (EP '606)**

The titanium alloy of the present invention and the titanium alloy of EP `606 should be classified into quite different groups of titanium alloys.

EP `606 describes a titanium alloy containing, in weight percent, one or more of the platinum group metals in a small amount, i.e., 0.01 - 0.14% in total, at least one of Ni and Co each in an amount of 0.1 - 2.0%, with an oxygen content limited to not more than 0.35% and an Fe content limited to not more than 0.3% , optionally at least one of Mo, W and V each in an amount of 0.1 - 2.0% and the balance of Ti.

This chemical composition provides a microstructure of a matrix $\alpha$ phase of Ti containing precipitates of $Ti_2Co$ and $Ti_2Ni$, as described in page 3, line 32 of EP `606.

In contrast, the alloy composition of the present invention provides a microstructure of an $\alpha + \beta$ dual phase of Ti as specified by the claims and demonstrated in the specification, from page 7, line 13 to page 8, line 1

summarizing $\alpha+\beta$ dual phase alloys, all of which is not disclosed or suggested in EP `606.

There is also a difference between EP `606 and the present invention because EP `606 limits the contents of oxygen and Fe, which both greatly contribute to the alloy strength, which is essential to the present inventive alloy as stated in the leading part of each claim. This means that EP `606 does not consider the alloy strength as an important property.

For example, EP `606 describes, as a main process of producing a tube, a process including bending a hot or cold strip followed by welding.

However, in a high strength $\alpha + \beta$ alloy of the present invention, it is usually very difficult to produce a hot strip having a thickness of 6 mm or more to which the present invention is directed, and further, it is actually impossible to cold-roll the present inventive high strength alloy to that thickness. The present invention uses a thick and medium plate, as described in the specification, page 5, lines 20-21.

It should be also noted that EP `606, in Table 1, shows high strength samples Nos. 60, 61, and 62, which have an overall evaluation of "X" meaning "bad" because of their poor ductility. This shows that high strength alloy compositions not belonging to an $\alpha + \beta$ dual phase alloy group cannot provide tubes having good properties when produced by cold forming plus welding.

Thus, the present invention is not directed to an alloy of EP `606 having an α matrix phase and naturally exhibiting good formability but is directed to a high strength α+β dual phase titanium alloy, which is difficult to cold form.

Further EP `606 only discloses TIG and plasma welding methods applied to an alloy having an α matrix phase as a welding method after bending but does not disclose or suggest application of those welding methods to a high strength α+β titanium alloy of the present invention.

As discussed above, the present invention is very different from EP `606 because of a large difference in microstructural phase leading to a large difference in alloy properties exhibited during forming and welding.

**Shida et al. (USP 4,859,415)**

The Office Action takes the position that Shida indicates that it is conventional in the art to employ either a Ti-6A1-4V or a Ti-3A1-2.5V α+β alloy in the seam welded pipe making art (Shida et al., Table 1).

It is true that Shida discloses α+β alloys including the above-recited alloys, with or without platinum group elements, applied to an oil-well tubular product, i.e., a tube or pipe.

However, Shida does not provide any suggestion of a reduced unevenness of wall thickness, a cold bending and a one-seam welded pipe, which are the object of the present invention as described in the present specification, particularly the background art section from page 1, line 10 to page 2, line 37.

In fact, Shida, in Examples, particularly column 7, lines 39-61, does not produce a pipe or tube but only produces a 4 mm-thick rolled, small plate specimen using a small amount melting. No test of weldability is disclosed. A bending test was conducted under stress by immersing a test piece bent to a small degree (column 8) but does not suggest a tube or pipe forming process by bending.

**Meredith et al. (USP 5,226,981)**

The Office Action takes the position that Meredith also indicates that it is conventional in the art to employ either a Ti-6Al-4V or a Ti-3Al-2.5V $\alpha+\beta$ alloy in the seam welded pipe making art (Meredith et al., column 3, lines 29-31).

It is true that Meredith refers to Ti-3Al-2.5V and Ti-6Al-4V alloys but Meredith is clearly distinguished from the present invention for the following reasons.

Meredith works a seam welded stock or a seam welded tube hollow by cold pilgering to provide a tube having a desired size and property, in which a substantial cold working is applied not only to a base material but also to a weld area. This unavoidably involves an applicability limit

in size based on the capacity of a cold forming machine even when working a soft material such as pure titanium and the applicability limit in size becomes more severe when working a high strength α+β titanium alloy.

In fact, Meredith, column 3, lines 38-40, describes that a tube hollow is preferably fabricated by welding a rolled sheet or strip, which is easy to bend and weld. Meredith is not directed to a tube or pipe fabricated from a thick and medium plate as used in the present invention.

Meredith discloses at column 4, lines 44-46 an example in which a welded tube stock is made of pure titanium but only has an outer diameter of 2.375 in (about 61 mm) and a wall thickness of 0.036 in (about 0.9 mm), which are far smaller than those of the present invention, i.e., an outer diameter of at least 150 mm and a wall thickness of at least 6 mm.

**Combined References**

The Office Action takes the position that EP `606 discloses inclusion of a platinum group element although it does not include Al, that Shida discloses Ti-6Al-4V and other α+β alloys including a platinum group element and that Meredith is directed to production of a highly corrosion resistant seam welded pipe.

However, as discussed above, the present invention is distinguished from the cited references for the following reasons:

(1) The alloy of EP `606 is different in the microstructural phase from the present inventive alloy, even when it contains Al and platinum group elements.

(2) Shida does not contain any description which suggests a seam welded pipe and is also silent about a pipe having a size of the present invention. The inclusion of platinum group element is to provide an improved corrosion resistant and has no relationship with the reduced unevenness of wall thickness and the production of pipe by cold bending and one-seam welding. The inclusion of platinum group element is not an essential feature of the present invention.

(3) Meredith discloses a pipe size quite different from that of the present invention and cannot provide a pipe of the present invention.

It is therefore submitted that claims 1-5, 7-9 and 16-27 are patentable over EP `606 or EP `606 in view of Shiba and/or Meredith.

VERSION WITH MARKINGS TO SHOW CHANGES MADE

**The following is a marked version of amended claim 7.**

--7. (Amended) A method of production of a pipe having an outside diameter of at least 150 mm and a wall thickness of at least 6 mm, comprised of a high strength $\alpha+\beta$ titanium alloy, having a welded seam running in the longitudinal direction of pipe at one location, and having a ratio of a minimum wall thickness to a maximum wall thickness of the portions excluding the weld zone of 0.95 to 0.99, said method of production of a high strength $\alpha+\beta$ titanium alloy pipe characterized by cold forming a high strength $\alpha+\beta$ titanium alloy plate of a thickness of at least 6 mm into a tubular shape by a [U-O method or] method comprising U-shape press bending into a U-shape and further O-shape pressing into an O-shape or a method comprising a press-bending method and welding together the abutted plate edges--.

## CONCLUSION

It is submitted that in view of the present amendment and foregoing remarks, the application is now in condition for allowance. It is therefore respectfully requested that the application, as amended, be allowed and passed for issue.

Respectfully submitted,

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